

Remarks:

Claims 1-37 are currently pending in the present application. Claims 1, 2, 11, 12, 21, 22, 28, 29 and 35 have been amended herein. Therefore, claims 1-37 are still pending in the application.

Claims 2, 12, 22, and 29 were rejected under 35 U.S.C. § 112, second paragraph. Examiner objected to the format of "A, B, or C" in a Markush group. The claims have been amended to use the preferred format of "A, B, and C." Applicant respectfully notes that the amendment to claims 2, 12, 22, and 29 does not narrow the scope of the claims. This is because the claims, as originally written, contemplated any of the recited group elements and after amendment, any of the recited group elements are still within the scope of the claim.

Claims 1, 11, 21 and 28 are amended herein to correct a typographical error (adding "and"). Claim 28 has also been amended to correctly identify a "second set of vias." Claim 35 has been amended to correctly identify the "recoat" layer. It is believed that these amendments do not affect the scope of the claims.

Claims 1 through 37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mullee (U.S. Patent 6,500,605) in view of Biberger ("Photoresist and Photoresist Residue Removal with Supercritical CO₂— A Novel Approach to Cleaning Wafers") and Hornbeck (U.S. Patent 4,956,619). Applicant respectfully traverses the rejection for the following reasons.

Claim 1 requires forming a sacrificial layer on a substrate, "fabricating a micro-mechanical device on the sacrificial layer," and "removing the sacrificial layer." Examiner has not identified, and Applicant is unaware of, any teaching in Mullee or in Biberger of a sacrificial layer upon which a micro-mechanical device is formed. Hornbeck does teach a spacer layer 24 upon which a reflective layer 26 and flap 28 is formed. However, there is no motivation to combine Hornbeck with Mullee or Biberger.

In fact, Hornbeck teaches away from a combination with Mullee or Biberger. Hornbeck teaches the formation of a spacer layer 24. Specific and select portions of this spacer layer 24 are removed using an isotropic plasma etch, and using aluminum layer 26 as a pattern mask (specifically the plasma etch access holes 30 and plasma etch gap

shown in Figure 1 and discussed at Col. 9, lines 57 – 60) to ensure that only selected portions of spacer layer 24 are removed. Note that most of spacer layer 24 remains after the plasma etch (see Figures 1A, 1B, 2, and 4A through 4G). This is because spacer layer 24 is used to support the overlying aluminum layer 26 in which is formed the flap 28 (Figures 1A, 1B, 2, and 4A through 4G). In fact, Hornbeck specifically addresses the need to carefully limit and control the portions of spacer layer 24 that are removed. As Hornbeck teaches, “Of course, the plasma etch in step 9 must be monitored or timed because the continued removal of spacer beyond that between the flap and the substrate will eventually remove the support for the reflective layer and encroach on neighboring pixels” (See Col. 10, lines 11 – 66).

By stark contrast to the patterned removal offered by isotropic plasma etching (as required by Hornbeck), both Mullee and Biberger teach a process in which the entire photoresist layer is “removed” or “completely removed” (Mullee at Abstract and Biberger, page 242, respectively). Mullee and Biberger, on the one hand, and Hornbeck, on the other hand, have diametrically opposed goals and approaches. Mullee and Biberger seek to effectively and completely remove a photoresist layer whereas Hornbeck teaches selectively removing only portions of a spacer layer without removing the remainder of the layer. Clearly there is no suggestion or motivation to combine these two very different approaches to solving completely different problems and to accomplish very different goals. In fact, the teachings of Mullee and Biberger are incompatible with the teachings of Hornbeck. For these reasons, there is no motivation or suggestion to combine Hornbeck with either Mullee or Biberger. Applicant respectfully requests withdrawal of the rejections based upon the improper combination of the references.

Claims 2 through 10 are also patentably distinct over the cited references for the reasons provided with regard to claim 1, from which they depend, as well as for the further defining limitations contained within the respective dependent claims.

Claim 11 is unobvious over the cited references for the reasons provided above with regard to claim 1 and also for the following reasons. Claim 11 recites “depositing at least one sacrificial layer” upon which is formed a micro-mechanical device, “removing the sacrificial layer,” “recoating the micro-mechanical device with a recoat layer” and

“removing the recoat layer.” Examiner has not identified and Applicant is unaware of any teaching or suggestion in Mullee or Biberger of a sacrificial layer upon which is formed a micro-mechanical device in combination with a recoat layer.

Examiner has also not provided any citation to the Hornbeck reference. Applicant has assumed, however, that Examiner is treating the “positive resist spacer” shown in Hornbeck’s Figure 11B as analogous to Applicant’s sacrificial layer and is treating the “protective PMMA” shown in Hornbeck’s Figure 11C as analogous to Applicant’s recoat layer. Assuming for the sake of argument that Mullee and Biberger are properly combinable with Hornbeck (which as demonstrated above with regard to Figure 1, they are not), the combination of these three references still does not meet the recited claim elements. Mullee and Biberger teach completely removing a photoresist layer using a supercritical carbon dioxide co-solvent. There is no teaching or suggestion in Mullee or Biberger to remove a PMMA (polymethyl methacrylate) layer using supercritical carbon dioxide. In fact, the record appears void of any suggestion that supercritical carbon dioxide would remove PMMA.

More importantly, Hornbeck teaches away from using supercritical carbon dioxide to remove the PMMA recoat layer. This is because Hornbeck clearly teaches that removal of the PMMA layer does not affect the underlying photoresist layer (spacer layer 24). As Hornbeck teaches, “dissolve the PMMA by spraying with chlorobenzene and immediately centrifuge to remove the dicing debris, note that the positive resist [spacer layer 24] does not dissolve in the PMMA developer” (Col. 9, lines 64-67). Thus, Hornbeck teaches away from using supercritical carbon dioxide to remove the PMMA protective layer because, as taught by Mullee and Biberger, the supercritical carbon dioxide would clearly dissolve the resist. Hence, one of ordinary skill in the art would find no motivation to combine the references and would, in fact, recognize a clear motivation against their combination.

Claims 21-37 were rejected over the Mullee, Biberger, and Hornbeck references, with Examiner asserting that “Biberger does not teach the specific processing as recited in claims 21-37. This is taught by Hornbeck.” Applicant respectfully disagrees. For instance, claim 21 recites “depositing a first sacrificial layer,” “removing portions of the

first sacrificial layer” to define vias and “removing the first . . . sacrificial layer.”

Applicant finds no teaching or suggestion in Hornbeck to both remove portions of the first sacrificial layer and to remove the first sacrificial layer. In fact, as explained above with regard to claim 1, Hornbeck expressly teaches away from removing the first sacrificial layer because it is used to structurally support an overlying metal layer (see Figures 1A, 1B, 2, and 4A through 4G, and Col. 10, lines 11 – 66). Hence, Hornbeck fails to teach or suggest the recited claim elements.

Claim 21 also requires “depositing a second sacrificial layer,” “removing portions of the second sacrificial layer” to define vias, and “removing the . . . second sacrificial layer.” First, Applicant finds no teaching or suggestion in Hornbeck to deposit, pattern, and remove two sacrificial layers. Applicant respectfully submits that it is only with the benefit of hindsight provided by Applicant’s disclosure that one would be motivated to modify Hornbeck to provide for a multi-level system having both a first and a second sacrificial layer. Second, as discussed in the preceding paragraph, the teaching of Hornbeck is expressly contrary to claim 21, in which the second sacrificial layer is removed. This is because Hornbeck teaches using the sacrificial layer as a support for an overlying metal layer (see Figures 1A, 1B, 2, and 4A through 4G, and Col. 10, lines 11 – 66).

Claims 22 through 27 are also patentably distinct over the cited references for the reasons given above with regard to claim 21, from which they depend, as well as for their further respective defining recitations.

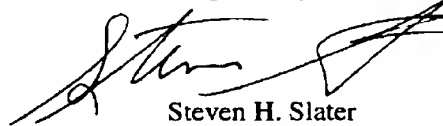
Claim 28 also requires depositing a first sacrificial layer and a second sacrificial layer, and removing portions of the first sacrificial layer and the second sacrificial layer to define vias and via forms, respectively. Nothing in Hornbeck teaches or suggests the use of two sacrificial layers and/or the formation of vias within the sacrificial layers. Further, claim 28 requires forming a recoat layer and removing the recoat layer using supercritical carbon dioxide. As discussed above with regard to claim 11, Hornbeck clearly teaches away from this claim limitation by teaching removing the protective PMMA coating using a solvent that does not dissolve photoresist. For these reasons, as well as

the reasons provided above with regard to claim 1, claim 28 is patentably distinct over the cited references.

Claims 29 through 37 depend from claim 28 and are also unobvious over the cited references for the reasons given with regard to claim 28 as well as for their further respective defining limitations.

Applicant respectfully requests reconsideration and withdrawal of the rejection of claims 1-37 and requests that the present case be promptly passed to issuance.

Respectfully submitted,



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